

REMARKS/ARGUMENTS

Claims 1-20 stand in the present application, claims 1 and 6 having been amended and new claims 9-20 having been added. Applicants note with appreciation the Examiner's indication of allowable subject matter in claim 3, but respectfully submit that in view of the above amendments and the following remarks that all of the claims standing in the application are in condition for allowance.

As required in the Office Action, revised Figures 8 and 12 are submitted herewith.

The Examiner has rejected claims 1, 2, 4, 5 and 7 under 35 U.S.C. § 103(a) as being unpatentable over Noda and has rejected claims 6 and 8 under 35 U.S.C. § 103(a) as being unpatentable over Noda in view of Kuisell. Applicants respectfully traverse the Examiner's § 103 rejections of the claims.

Applicants' invention is directed to a gas sensor having a gas sensing element fixed at both ends of a cylindrical insulator – at the proximal end with sealing material and at the distal end by a soft cushion filler. Prior art devices only fixed the gas sensing element at one end of the insulator. An important feature of Applicants' invention is the additionally fixed end, preferably by use of the soft cushion filler which allows for shocks applied from the outside to be absorbed. As a result, the gas sensing element is prevented from being directly subjected to shocks transmitted from outside of the gas sensor.

More particularly, Applicants' gas sensing element is held at both its proximal and distal ends. Therefore, the gas sensing element does not swing like a pendulum when receiving shocks or vibrations. Accordingly, Applicants' invention prevents a

concentrated stress from acting on a portion serving as a swing center of the gas sensing element (i.e., a portion immediately below the portion firmly fixed with the sealing material) and also prevents the gas sensing element from colliding with the inner surface of the insulator. Therefore, the present invention effectively prevents the gas sensing element from easily cracking or breaking. Applicants have amended independent claims 1 and 6 to more clearly recite that the sealing material and cushion filler are respectively disposed at opposite ends of the element insertion hole, i.e., the proximal and distal ends of the element insertion hole.

Neither Noda nor Kuisell teaches or suggests a claimed cushion filler, or any other material, provided at the opposite (or distal end) of the element insertion hole for sealing a clearance between an inner surface of the element insertion hole and the outer surface of the gas sensing element. As clearly shown in Figure 1 of Noda, both the sealing element 32 and cushion element 34 are disposed at the same end (proximal end) of the element insertion hole. Indeed, sealing element 32 and cushion layer 34 are shown to be abutting at one end of insulator 4. This arrangement, of the sealing element 32 abutting against the cushion layer 34 at one end of the insulator 4, is also described in the cited reference at, *inter alia*, the Abstract and column 3, lines 3-20. Thus, Noda will suffer the same disadvantages as the prior art devices described in the present application at pages 1 and 2 with reference to Figure 13.

Kuisell has merely been cited by the Examiner for teaching "a gas sensor having an insulator comprised of separate bodies attached at their ends by a glass spacer (Figure 1)." Accordingly, it should be clear that Kuisell does not solve the deficiencies noted above with respect to Noda.

Hence, unlike Applicants' invention, the gas sensing elements disclosed in these references will exhibit a swinging motion like a pendulum, when shocks or vibrations are received, and, therefore, will tend to crack or break. Accordingly, claims 1-6 which now more clearly recite that the sealing material and cushion filler are disposed at opposite ends of the insulator, and their respective dependent claims are believed to patentably define over the cited references taken either singly or in combination.

Newly added claims 9-18 also recite the above-described patentable distinction over the cited art. More particularly, newly added independent claims 9 and 16 are directed to gas sensors in which the gas sensing element is securely fixed at opposite ends of a cylindrical insulator. Newly added independent claim 18 recites a method for protecting a gas sensing element of a gas sensor assembly by fixedly securing the gas sensing element at opposite ends of a central bore hole disposed within a cylindrical insulator. Accordingly, all of newly added independent claims 9, 16 and 18 and their respective dependent claims are believed to patentably define over the cited references, taken either singly or in combination, for the same reasons given above with respect to claims 1 and 6.

Newly added claims 19 and 20 are directed to apparatus and method wherein a sealing material is disposed in the larger cross-sectional area of an elongated aperture, through which the gas sensing element is mounted, and a cushion material is disposed in the smaller cross-sectional portion of the elongated aperture. Since the cited art does not teach or suggest placing a cushion material in the smaller cross-section of the elongated aperture of an insulator, these claims are also believed to patentably define over the cited art.

Therefore, in view of the above amendments and remarks, it is respectfully requested that the application be reconsidered and that all of claims 1-20, now standing in the application, be allowed and that the case be passed to issue. If there are any other issues remaining which the Examiner believes could be resolved through either a supplemental response or an Examiner's amendment, the Examiner is respectfully requested to contact the undersigned at the local telephone exchange indicated below.

Respectfully submitted,

NIXON & VANDERHYE P.C.

By: 


25640
Chris Comuntzis
Reg. No. 31,097

CC:Imr
1100 North Glebe Road, 8th Floor
Arlington, VA 22201-4714
Telephone: (703) 816-4000
Facsimile: (703) 816-4100